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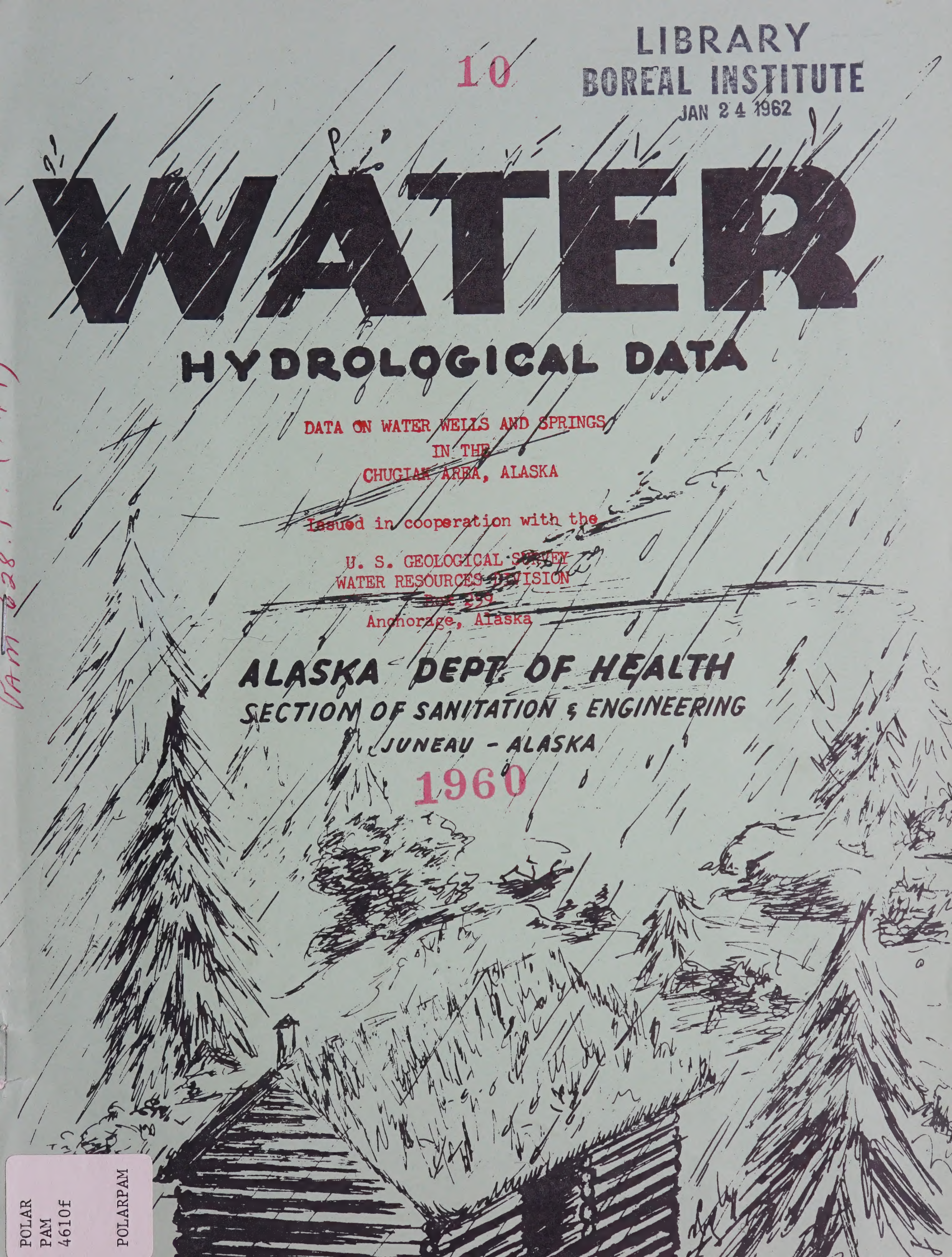

WATER

HYDROLOGICAL DATA

DATA ON WATER WELLS AND SPRINGS
IN THE
CHUGIAK AREA, ALASKA

Issued in cooperation with the

U. S. GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
Box 259
Anchorage, Alaska

ALASKA DEPT. OF HEALTH
SECTION OF SANITATION & ENGINEERING
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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
Water Resources Division
Ground Water Branch

DATA ON WATER WELLS AND SPRINGS IN THE CHUGIAK AREA, ALASKA

By

Roger M. Waller

Anchorage, Alaska

1960

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DATA ON WATER WELLS AND SPRINGS

IN THE

CHUGIAK AREA, ALASKA

By Roger M. Waller

ABSTRACT

The Chugiak area, in south-central Alaska, is rapidly being settled, principally by people working in the Anchorage area. The area is a glaciated bench along the Chugach Mountain front on the south shore of Knik Arm. The Glenn Highway traverses the portion covered by this report.

Preliminary inventories of wells in the area and brief geologic reconnaissance indicate that glacial processes have determined the principal occurrences of ground water. The well data show that most wells penetrate sand and gravel deposited by former glacial melt-water streams. In addition, many wells, particularly the numerous dug wells, obtain water from sandy zones in glacial till. The till is a boulder clay locally called "hardpan". These wells and those drilled into the underlying metamorphic and sedimentary bedrock usually obtain only small quantities of water. The thickest sequence of unconsolidated deposits reported in well logs is over 400 feet, whereas bedrock is exposed at the surface in numerous places.

Chemical analyses were made of several samples and show that the water from wells and springs is moderately hard to hard, but is suitable for general domestic use.

PURPOSE AND SCOPE OF WORK AND REPORT

The data presented in this tabulation were gathered by the U. S. Geological Survey in connection with the investigation of the ground-water resources of Alaska begun in 1947.

The Chugiak area was selected in 1955 for study because of the rapid increase in settlement for homesites and difficulty in obtaining satisfactory ground-water supplies.

The work has been carried on by the Geological Survey, United States Department of the Interior, under the direction of R. M. Waller, geologist in charge of ground-water studies in Alaska. Field assistants in successive field seasons in the Chugiak area were: J. W. Allen, D. B. Bailey, G. W. Tieman, and F. C. Hankinson. Many of the well records were collected by F. W. Trainer, geologist, Ground Water Branch, and Pfc. Robert Warner, geologist, U. S. Army, prior to this investigation.

Acknowledgments

During the period of investigation many well drillers kindly furnished well logs and discussed ground-water and drilling conditions in the area. Among those who were especially helpful were: Phil Brandl, Jack Merrington, A. R. McInroy, L. A. Schachle (Penn-Jersey Drilling Company) Charles Schachle, W. S. Swafford, all of Anchorage; and Sam Cotten and Clayton Gore of Palmer. Robert Cross, J. D. Conboy, Sunset Drilling Company, and Hyland Drilling Company of Spenard; and Moffit Drilling Company of Palmer, also supplied well logs.

The Bureau of Public Roads (and its forerunner, the Alaska Road Commission) and the Bureau of Land Management, U. S. Department of the Interior, provided maps having projected land nets which made it possible to locate many of the wells according to the federal land net. The Bureau of Reclamation provided well logs and information on the Eklutna tunnel. In addition, many local residents contributed data and assistance which materially aided the work.

LOCATION AND GENERAL FEATURES OF THE AREA

Geography

The Chugiak area portion of land at the head of Cook Inlet, in south-central Alaska, bounded on the south by Eagle River, on the west by Knik Arm, on the north by Knik River and on the east by the Chugiak Mountains. (see figure 1.) Specifically, it includes in this report the area along the Glenn Highway and adjacent local areas, such as Eagle River Heights, Birchwood, and Eklutna. The military reservation comprising much of the western portion of the area is not included in this report.

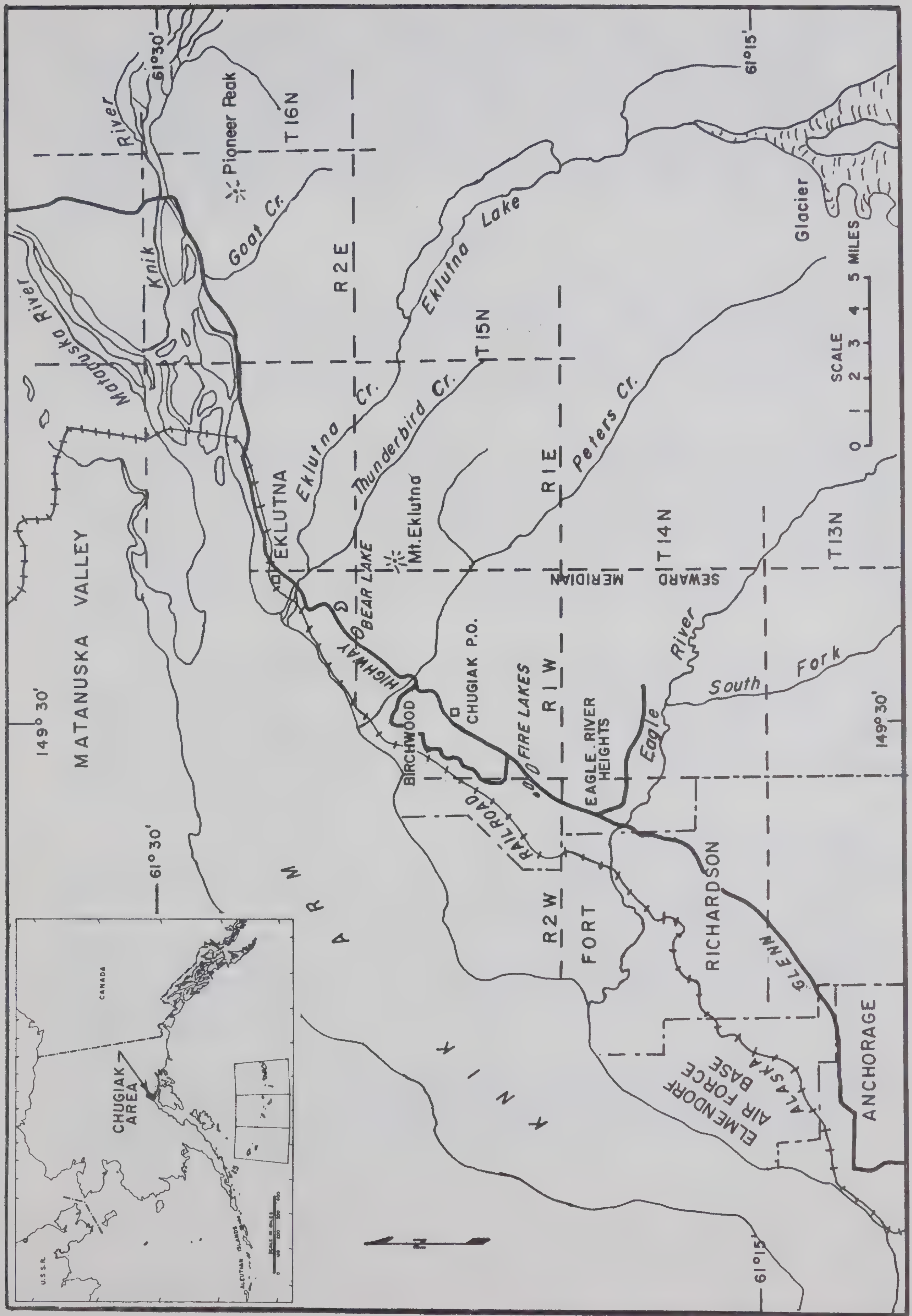

FIGURE I.—SKETCH MAP OF THE CHUGIAK AREA, ALASKA

The area comprises a relatively low bench along the base of the Chugach Mountains which rise precipitously to altitudes of more than 7,000 feet. Several major streams (most of them glacial in origin) and numerous smaller streams emerge from the mountains and flow westward to Knik Arm. The bench along and to the west of the highway has a very undulating topography which rises gently to the base of the mountains reaching its greatest altitude, perhaps 6-800 feet, in the Eagle River area.

Geology

Intensive studies of the geology and ground-water conditions in the Matanuska Valley north of Knik Arm (Trainer, F. W., 1960) and south of Eagle River in the Anchorage area (Cederstrom, D. J., Trainer, F. W., and Waller, R. M., written communication), along with brief reconnaissances in the Chugiak area indicate the following geologic interpretation.

The area has been glaciated several times during the "ice age" by glaciers which still have remnants in the heads of most of the valleys in the Chugach Mountains. The glaciation, principally along the lateral margin of an extensive piedmont-type glacier, resulted in intensive modification of the pre-existing topography. The glacial retreats deposited much material (till) along the front of the mountains. Meltwater streams from the receding ice reworked the glacial till and deposited sorted sediments (glacio fluvial deposits) as the valleys were gradually cut to their present level.

Bedrock, representing the consolidated-rock floor of the ancient Knik Valley, protrudes through the overlying glacial and alluvial (stream-laid) deposits in numerous places in the Chugiak area. Metamorphic and igneous rocks, principally, make up the bedrock and also form the adjacent Chugack Mountains (Capps, S. R., 1940, p. 53-61 and plate 1). However; sedimentary rocks crop out near the Eagle River bridge and were encountered in a few wells near the southwest end of the area.

The glacial, glacio fluvial, and alluvial deposits in the Chugiak area consist of clay, silt, sand, gravel, cobbles, and boulders. Glacial till (locally called hardpan) is usually charcertized by hard clay and boulders. It presents a formidable obstacle in the digging of wells, and in surface exposures, creates a very unstable ground when saturated with water. The silt, sand, and/or gravel beds are scattered throughout the area, predominantly, in areas adjacent to the major stream valleys. The thick clay and (or) silt formations are thought to be estuarine or lake deposits.

The thickness of the unconsolidated material in the Chugiak area ranges from zero to at least 400 feet in the Birchwood area. The great variation in thickness is due to the undulating topography and also to the apparently irregular bedrock floor.

Hydrology

Ground water is that which occurs in pore spaces and fissures in rocks of the earth's crust. It is derived from precipitation, melting of snow, and from bodies of water. The water moves by gravity downward until it reaches the zone of saturation and then moves laterally to points where it is discharged naturally through seeps and springs into streams or lakes, by evaporation, or by transpiration by plants. Ground water contained in permeable beds, such as sand or gravel, can be withdrawn readily from wells that penetrate those deposits.

Based on the complex glacial history of the region and on the compiled well logs, the area probably does not have extensive aquifers, except in the terrace deposits along the major streams. The predominance of glacial till and the presence of the metamorphic and igneous rocks of the valley floor indicate that ground water probably occurs principally in thin, permeable, sand or gravel zones within the till and in buried, sinuous sand and gravel beds of ancient glacial streams.

Ground water is also present in the bedrock, but in limited quantities. Usually, the wells drilled in bedrock have to penetrate several hundred feet of rock in order to encounter sufficient fractures containing enough water to supply small users. Construction of a large tunnel near Eklutna to tap Eklutna Lake for hydroelectric power reportedly encountered tremendous quantities of water. A chemical analysis of water from a fault zone in the tunnel is included in table 2.

Water-level observations indicate that the lowest water levels occur during March-April before the spring break-up occurs. Highest water levels occur in September and October.

The chemical analyses (see table 2) of the well waters show that the water is generally of good quality.

Water from wells have been obtained in most part of the Chugiak area. Much difficulty is encountered in both the drilling and the digging (dug wells are most common in area) of wells owing to the presence of the hard glacial till and boulders in many parts of the area. Driven wells have been successful only in places adjacent to stream beds where clay, till, or boulders are absent. It appears that the most difficult places for obtaining water from wells are immediately adjacent to bedrock exposures and near the base of the steep mountain fronts. Here the glacial till, or impermeable deposits, lie directly on the bedrock and provide few permeable zones to transmit and store water.

Springs are common throughout the area along the upper part of the lowland. The springs represent areas where ground-water emerges from permeable zones in the unconsolidated material or from fractures in bedrock. Chemical analyses (table 2) of a few spring-water samples indicate that the water is not from a deep-seated source.

Many of the smaller springs reportedly dry up, or diminish greatly, by the end of long cold winters. Similarly, shallow dug wells present the same problem. This occurrence, usually every year, is due to the long period when recharge to the aquifers does not occur because of the deep frost and diminishing stream flow.

The major streams flow all year, but the discharges diminish considerably during the winter. Miscellaneous measurements of discharge have been determined (U. S. Geological Survey 1957, 1958a, 1958b, 1960a, 1960b. For the major streams in the Chugiak area at different times. Chemical analyses have been made of the waters of the streams also, and selected results are included in table 2.

WELL TABULATION

During the 1955-58 field seasons, a well inventory was made in the Chugiak area. Locations and descriptions of wells visited were recorded and the altitude of the land surface at many wells was determined with an altimeter. Depths to water levels in wells were measured with a steel tape wherever possible, or were reportedly by the driller or owner of the well.

Data for 142 wells are given in table 1. Other wells visited are not listed in table 1 because little or no information was available. The wells were located by the approximate mileage as indicated by mileposts which give the mileage from Anchorage along the Glenn Highway and/or by the township, range, and section where known. The tabulation begins at the Eagle River bridge on the Glenn Highway and extends to the Knik River bridge. Where secondary roads to sub-areas occur, a separate listing of wells is inserted, such as Eagle River Valley.

Chemical analyses and selected well logs are included in the tables at the end of the report. The well logs represent driller's reports of the formations encountered. The author took the liberty of rearranging many of the driller's formation descriptions to help clarify them. Words in quotes are the author's interpretation of non-descriptive terms.

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Table 1.--Data on wells and springs in the Chugiak area, Alaska

Milepost: Milepost given is the approximate mileage, to the nearest 0.1 mile, as determined by existing mileposts on the Glenn Highway which indicate the mileage from Anchorage.

Altitude: Altitude where given is the land-surface datum at the wells as determined by altimeter using Bureau of Public Roads and Geological Survey bench marks for control. Land-surface datum is fixed plane of reference approximately at the general land-surface near the well.

Depth of well: Depths given in whole feet are reported or from drillers' logs; those given in feet and tenths were measured.

Type of well: Dd dug and driven, Dr drilled, Du dug. Well diameter is given in inches.

Water level: Measured depth to water is given in feet, tenths, and hundredths and reported or approximate depth to water is given in whole feet. F means a flowing well.

Use of well: D destroyed, Dm domestic, I industry, PS public supply, S stock, U unused.

Other data available: L log and C chemical analyses. These data are included in tables 2 and 3.

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (Inches)	Water level: Date	Water level (feet below land surface)	Use	Remarks

GLENN HIGHWAY

Township 14 North, Range 2 West

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (Inches)	Water level: Date	Water level (feet below land surface)	Use	Remarks
1	13.1, NE¼ sec 14	Bureau of Land Management	River terrace		220	15+	Du		6+	PS	Cobbles and boulders
2	13.4, NE¼ sec 14	W. M. Collins	do	1955	210	20	Du 48	7-10-57	8.31	Dm	Shale (?) at bottom.
3	13.4, SE¼ sec 11	H. W. Jones	Hill-slope	1954		18	Du 48	8- 4-55	8.5	Dm	Gravel and sand.
4	13.5, SE¼ sec 11	J. O. Rebischke	Slope	1954		16	Du 48	Fall-54	12	Dm	Gravel, rock, and clay 0-14, blue clay 14-15, sand and gravel(?) 15-16.
5	13.5, SE¼ sec 11	Adam Kruscauvage	Edge of terrace	1955		30±	Du 48	8- 4-55	20+	Dm	Gravel and cobbles 0-8.
6	13.5, SE¼ sec 11	J. F. Jernigan	do	1954		30±	Du 48	8- 4-55	23.19	Dm	Cobbles and gravel.
7	13.6, SE¼ sec 11	J. G. Carnahan	Level	1955	288	13±	Du	6- ?-57	8	Dm	
8	13.8, SE¼ sec 11	C. F. McAllister	do	1957	300	30	Du	7- 2-57	20	Dm	
9	13.8, SE¼ sec 11	A. E. Hansen	Slope	1956	298	30	Du	7- 2-57	25	Dm	Water below hardpan
10	13.9, SE¼ sec 11	Alaska Woodcraft	Level			25±	Du	8- 4-55	24.6	Dm	Small supply.
11	14.1, NE¼ sec 11	Far North Trailer Court and Service Station	do	1954		25	Du 60	8- ?-54	19	Dm PS	Boulders and clay.

EAGLE RIVER VALLEY AREA

Township 14 North, Range 1 West

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (Inches)	Water level: Date	Water level (feet below land surface)	Use	Remarks
12	SW¼ sec 7	Dale Pearson	Hill-slope	1957	110		Dr 4	2- ?-57	99	Dm	L
13	NE¼ sec 7(?)	Paul Jones	Slope	1957	20		Du	7-?-57	12	Dm	

Table 1

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (inches)	Water level: Date	Water level: (feet) below land surface	Use	Remarks
EAGLE RIVER VALLEY AREA											
Township 14, North, Range 1 West											
14	sec 16	Frary	Ridge crest	1956		145	Dr 4			Dm	70 feet of quicksand.
15	NE$\frac{1}{4}$ sec 17	M. B. Johnson	Slope	1956		178	Dr 4	?- ?-56	115	Dm S	Hardpan, casing pulled to 140, sand point installed in brown sand.
Township 14 North, Range 2 West											
16	SE$\frac{1}{4}$ sec 11	E. J. Gunter	Slope	1956		78	Dr 6			Dm	
17	SE$\frac{1}{4}$ sec 11	Balzwin	do	1954		37	Du 48	Summer-55	30	Dm	Replaced by drilled well.
18	SE$\frac{1}{4}$ sec 11	do	do	1957		126	Dr 6	7-10-57	90	Dm	L, drilled in dug well.
19	SE$\frac{1}{4}$ sec 11	Glenn Briggs	Creek terrace			32	Du	Fall-55	20	Dm	
20	SE$\frac{1}{4}$ sec 11	Don Murphy	do	1953		45	Du 48	?- ?-53	25	Dm	Deepened 1955, gravel and cobbles 35-45.
21	SE$\frac{1}{4}$ sec 11	J. T. Spoerry	do	1953±		25	Du 48	8- ?-55	15	Dm	Deepened 1955.
22	SW$\frac{1}{4}$ sec 12	Larsen	Edge of	-	-	-	Spring	-		Dm	C, temperature 38°.
23	SW$\frac{1}{4}$ sec 12	Ed Willis	Hill top	1953		69	Dr 4	?- ?-53	34±	Dm	All brown hardpan.
24	SW$\frac{1}{4}$ sec 12	Glenn Briggs	Slope	1950		32	Du	7- ?-57	26	Dm	
25	SW$\frac{1}{4}$ sec 12	Hedlaugh		1953		80	Du 48		75	Dm	Sand and gravel
26	SE$\frac{1}{4}$ sec 12	Brasnahan	do	1956		120	Dr 4		12	Dm	All brown hardpan.

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well	and diameter (inches)	Water level Date	(feet) below land surface	Use	Remarks

GLENN HIGHWAY

Township 14 North, Range 2 West

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well	and diameter (inches)	Water level Date	(feet) below land surface	Use	Remarks
27	14.0, NW¼ sec 12	Eagle River Trailer Court	Level	1952		78	DR	6	4-7 ?-52	26	PS	Boulders and gravel
28	14.1, NW¼ sec 12	Bruce Arndt	do			27±	Du			20+	Dm	
29	14.1, NW¼ sec 12	Theodore Ball	Hill-slope	1957	371	95	DR	6	7- ?-57	66		L
30	14.2, NW¼ sec 12	O. J. McGann	Base of slope	1954		26	Du		Summer-55	10	PS	
31	14.2, NW¼ sec 12	C. A. Anderson	Knoll top	1952		147	Dr	6			Dm	Drilled in 30-foot dug hole.
32	14.2, NW¼ sec 12	Paulson	Slope		390	148	Dr	6		80	Dm	
33	14.2, NW¼ sec 12	John Waldrop	Hill-slope	1954		148	Dr	6	?-?-54	96	Dm	2½ gpm, first water at 96, hit bedrock(?).
34	14.2, NW¼ sec 12	M. L. Folden	do	1955		134	Dr	6	9- ?-55	25	Dm	L, 10 gpm.
35	14.2, NE¼ sec 12	Robert Lowe	do	1955		139	Dr	6	Spring-55	99	Dm	Boulders and gravel 0-95, bedrock 95-139 (water at 129).
36	14.3, NW¼ sec 12	Lazy Mountain Trailer Court	Slope	1951		75½	Dr	6	7- ?-51	32	Dm PS	Boulders and gravel.
37	14.3, NE¼ sec 11	The Chick Inn	Level	1952		21	Du	60	Spring-52	20+	PS	
38	14.4, NE¼ sec 11	B. T. Frary	do		330	116	Dr	6	9-20-55	31.4	Dm	
39	14.4, NW¼ sec 12	McCluskey	do	1952		90	Dr	6	Spring-52	40	Dm	Boulders and gravel 0-54, soft gray silt 54-69, gravel 69-90.
40	14.4, NW¼ sec 12	Pipple	Slope	1957		43	Du	48			Dm	Mostly sand and gravel, very little clay, large boulder.
41	14.4, NW¼ sec 12	John Kirsch	Hill-slope	1952		92	Dr	6	2- ?-52	85	Dm PS	Boulders and gravel.
42	14.4, NW¼ sec 12	Grady Phillips	do	1952	413	91	Dr	6	Spring-52	78	PS	Dug hole 0-76, boulders and gravel.
43	14.4, NW¼ sec 12	do	do	1952	413	94	Dr	6	Spring-52	80	PS	Boulders and gravel.

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (inches)	Water level: Date	Water level: (feet) below land surface	Use	Remarks
44	14.4, NW¼ sec 12	R. L. Tedrow	do	1955		400	Dr 6	9-?-55	130	U	Boulders and gravel 0-102, bedrock 102-400, (first water at 140).
45	14.4, NE¼ sec 12	Eugene Fly	do	1952		23	Dr 6	9-22-55	15	Dm	Boulders and gravel 0-19, bedrock 19-23.
46	14.4, NE¼ sec 12	Don Schroeder	do	1955		143	Dr 6	Spring-55	98	Dm	Boulders and gravel 0-90, bedrock 90-143 (hit water at 154).
47	14.5, NE¼ sec 12	Jim Stegner	Knoll	1957	298	25	Du	7- ?-57	20	Dm	L
48	14.5, SE¼ sec 2	Texaco Service Station	do	1957	297	175	Dr 6			D	L, hole collapsed.
49	14.5, SE¼ sec 2	do	do			47	Dr			PS	
50	14.7, SW¼ sec 1	W. G. Pipple	Level		284	18.3	Du	9-16-55	7.7	U	
51	14.7, SE¼ sec 2	Leonard Ivie	Hill-slope	1954		32	Du 48	?- ?-54	28	Dm	Boulders 0-28, fine sand (water) 28-32, deepened in Feb. 1955 from 30 ft.
52	14.7, SE¼ sec 2	E. O. Whitt	Level	1955	280	110	Dr 4	6- 2-55	20	Dm	L, 10 gpm.
53	14.7, SE¼ sec 2	C. V. Starr	do			30	Du		27	Dm	Coarse gravel.
54	14.7, SE¼ sec 2	E. S. Rybarz	do				Du 48	9-22-55	17.60	Dm	
55	14.7, SE¼ sec 2	O. J. Ivie	do			40±	Du 48	9-22-55 9-12-58 9-18-59	28.75 32.76 25.90	Dm	Boulders 0-15, clay 15-40, (slow seepage of water).
56	14.7, SE¼ sec 2	do	do	1956		199	Dr			U	L, inadequate supply.
57	14.7, SE¼ sec 2	D. V. Hendrickson	do		278	22	Du 48	Fall-54 1- ?-55	18 20.5	Dm	Gravel with layer of hardpan.
58	14.7, SE¼ sec 2	Caton	do	1953		23	Du 48	Fall-54 1- ?-55	18 22	Dm	Water level 13-15 at high stage.
59	14.7, SE¼ sec 2	V. M. Peck	do		280	22.2	Du	9-16-55	16.7	Dm	
60	14.7, SE¼ sec 2	Tollis	do			57	Dr		50	Dm	
61	14.7, SE¼ sec 2	Petit	Knoll		280	27.4	Du	9-16-55	25.1	Dm	
62	14.8, SW¼ sec 1	H. W. Herrman	Level			39.9	Du		33.2	Dm S	Reported to be similar to Klein well.
63	14.8, SW¼ sec 1	Eagle River Service Station	do	1953	278	33.3	Du	?- ?-55	29.1	PS	Hardpan 0-8, sandstone(?) 8-35, Reported sulfur smell.

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude	Depth (feet)	Type well and diameter (inches)	Water level Date	Water level (feet) below land surface	Use	Remarks
64	14.8, SW¼ sec 1	J. E. Klein	do	1953	290	36	Du 48		30	Dm	Not used for drinking, sulphur smell.
65	14.8, SW¼ sec 1	Tip's Bar	Base of slope		288	25	Du	?- ?-55	18.5	PS	Mostly gravel with some sand.
66	14.8, SW¼ sec 1	Pete Manning	Slope		379	34	Du		28	Dm	Spring nearby.
67	15.0, NW¼ sec 1	Robert Schroeder	Level	1954	289	550	Dr 8&6	10- ?-54	10±	Dm S	L, C, gas seepage and sulphur taste.
68	15.4, NW¼ sec 1	Wm. J. Hendrickson	Base of hill		278	23	Du		18.5	Dm	

Township 15 North, Range 1 West

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude	Depth (feet)	Type well and diameter (inches)	Water level Date	Water level (feet) below land surface	Use	Remarks
69	16.4, NW¼ sec 31	R. R. Aubrey	Lake shore		462	11	Du		6.5		Hard formation.
70	16.4, SW¼ sec 31	Wm. Cairns	Creek valley	1952	558	10	Du	8- ?-55	8.17	S	
71	16.7, NW¼ sec 31	Fire Lake Service Station	Slope	1950	462	20	Du		14	PS	Loose gravel all the way.
72	16.8, NW¼ sec 31	E. J. Ryan	do	1956		50	Dr		Dry	U	L
73	17.1, SW¼ sec 30	Fire Lake Lodge	Ridge	1958	510	218	Dr 6			PS	L, C.
74	17.4, SE¼ sec 30		Hill top	1956±		60	DR 4	?- ?-56	57	Dm	Reportedly all hardpan, 10 gpm.
75	17.4, SE¼ sec 30	Oliver Walker	Hill-slope		516	8.6	Du	?- ?-55	4.4	Dm	
76	18.0, NE¼ sec 30	J. A. Davis	do		607	155	Dr		Dry	Dm	Gravel 0-48, boulders 48-155.

BIRCHWOOD AREA

Township 15 North, Range 1 West

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude	Depth (feet)	Type well and diameter (inches)	Water level Date	Water level (feet) below land surface	Use	Remarks
77	sec 5?	U. S. Army			120	402	Dr 6				Water from 230-260, filled with screened gravel to 206. 7 gpm.
78	SE¼ sec 7	D. M. Cleveland		1956		152	Dr 6	6-20-56		Dm	Gravel and rock 0-60, clay 60-150, water sand 150-152½, 10 gpm.

Table 1

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (inches)	Water Level Date	Water Level (feet) below land surface	Use	Remarks
79	SE¼ sec 7	Zaney	Edge of terrace	1954		29.7	Du	9-22-54	17.7	Dm	Boulders 0-15, blue clay 15-29.7.
80	NW¼ sec 8	H. McPherson	do			24	Du		6	Dm	
81	NE¼ sec 8	Jess Hayden	Terrace	1958		178	Dr 6			Dm	Dug 50 feet.
82	NE¼ sec 8	Koscheski	Top of bluff			14	Du		5±		Struck water at 6 feet, struck hardpan at 14 feet.
83	NE¼ sec 8	French	Level	1955	290	11.9	Du	9-22-55	11.4	Dm	Boulders and sand. Reported pumped 5 gal., recovery took approximately 12 hours
84	NE¼ sec 8	Wm. F. Ruter	Edge of terrace	1957		79	Dr 6	?- ?-57	39	Dm	
85	NE¼ sec 8	Mullins	do	1957		148	Dr			Dm	First water at 80.
86	NW¼ sec 9	A. P. Lamoreaux	do	1958		120	Dr 6	6- ?-58	100±	Dm	Water at 138. Hardpan at bottom.
87	NE¼ sec 18	Osborne	do		210	19.5	Du 24	9-23-54	15.2	Dm	
88	NE¼ sec 18	W. E. Jones	Level			35			29	Dm	Hardpan and gravel.
89	SE¼ sec 18	F. & J. Pegrenovich	do	1952		23	Du 48	10-28-53	14.84	Dm	Good quality, gravel, 0-15, hardpna 15-21.
90	SE¼ sec 19	Werre	do			15	Du		4	Dm	
91	sec 19	Phillips	do	1951	160	25	Du	9-23-55	16.5	Dm	Sandy gravel 0-4.
92	NE¼ sec 19	Wotherspoon	Hill-Top			16	Du		8	Dm	Water at 8 feet.
93	NE¼ sec 30	E. Boyington	Hill-slope	1957		16	Du		4	Dm	Hardpan 0-6, ½ gpm.
94	NE¼ sec 30	Wm. F. Garrison	do	1957		16	Du 48	5-27-58	16.2	U	Bouldery hardpan 3-9, sand 9-10, pea gravel 12-15, bouldery hardpan 15-16.

GLENN HIGHWAY

Township 15 North, Range 1 West

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (inches)	Water Level Date	Water Level (feet) below land surface	Use	Remarks
95.	18. NE¼ sec 30	Quiller Burns			550	64	Dr		12	Dm	L, 20 gpm.
96	18.5 SW¼ sec 30	Betty Eberhardt	Ridge	1956	526	49	Dr 6		F	Dm	Rock and gravel 1-39, hardpan 39-49, water at 49, 3 gpm.

Table 1

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (inches)	Water level Date	Water level (feet) below land surface	Use	Remarks
97	18.8 SW¼ sec 20	Media	Slope		430	18.9	Du	9-4-55	13.9	U	Went dry in January 1955.
98	19.8 SE¼ sec 17	Alaska Dept. of Education (Chugiak School)	Valley floor	1950	397	30	Dr 6	3-3-53 4-17-58	20.75 19.64	U	Inadequate as of 1952.
99	19.8 SE¼ sec 17	do	Hill-slope	1952 1953	400±	123	Dr 6	Fall-53 1-15-59 5-20-59 9-18-59	24 30.52 25.27 26.84	PS	Original depth 45 feet, boulder gravel 0-40, bedrock 40-123 water from gravel and (?) bedrock, 20 gpm.C
100	20. sec 16	Paul Wesolik		1958		143	Dr 6	6- 7-58	130	Dm	Top soil 0-1, hard-pan 1-134, sand and gravel (water) 134-143, 10 gpm.
101	20.3 SW¼ sec 16	Spring Creek Lodge	Level	-	425	-	Spring	-	-	PS	C.
102	20.7 NE¼ sec 9	Chugiak Chapel	do		423	121	Dr 6		114	PS	Gravel and boulders 0-121
103	20.8 SE¼ sec 9	Dan Delucia	Hill-slope	1951	426	107	Dr 6	?- ?-51	100	Dm	Gravel and clay 0-98, hardpan 98-107.
104	21.5 NE¼ sec 9	W. H. Stephens	Level	1953	355	165	Dr			Dm	Originally dug to 60 feet.
105	21.5 NE¼ sec 9	Russel Oberg	Hill top	1954	367	196	Dr 6	7- ?-54	131	Dm	L, 11 gpm.
106	21.6 NE¼ sec 10	Earl Ray	Hill-slope	1954	454	175	Dr	10-13-54	158	Dm S	L, originally drilled 110 feet, 13 gpm.
107	21.7 NW¼ sec 10	Dari-Delite	Level	1954	347	145	Dr	9- ?-54		PS	Bouldery hardpan 0-143, gravel 143-145, 13 gpm.
108	21.7 SE¼ sec 10	"Bud" Whaley	Hill-slope	1956		188	Dr 6	10-18-56	165	Dm	L, 10 gpm.
109	21.7 NE¼ sec 10	John Schneider	slope		528	46+	Dr		45	Dm	L, possibly deepened.
110	21.8 NW¼ sec 10	Ramsey			380	30.7	Du	9-13-55	24.8	Dm	
111	21.8 NW¼ sec 10	W. D. Allred	Level	1950	371	27	Du	9-14-55	19	Dm	Reported silting and caving.
112	21.9 SW¼ sec 3	Rowlette	do		370	48	Dr		48±	Dm	
113	21.9 SW¼ sec 3	Gilbert Rosenberd	do	1955	386	65	Dr 6	6- ?-55	49	Dm	Hardpan with rocks 0-64, sand and gravel (water) 64-65, 10 gpm

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude	Depth (feet)	Type well and diameter (inches)	Water level Date	Water level (feet) below land surface	Use	Remarks
114	22 SW¼ sec 3	Ray Michlig		1959		80	Dr 6	5-19-59		Dm	L, 4½ gpm.
115	22 SW¼ sec 3	Guy Johnson	do	1955	361	57	Dr	6- ?-55	25	Dm	All brown hardpan.
116	22.1 SW¼ sec 3	Tiny's Tavern and Bernies Liquor Store	do	1952	368	87	Dr 6	9-14-55	74	Dm	L, 20 gpm
117	22.2 SW¼ sec 3	F. J. Smith	do	1957	370	93	Dr			Dm	
118	22.4 SW¼ sec 3	L. V. Jahr	Hillslope	1957	369	115	Dr 6	7- 8-57	110	Dm	L, 5 gpm.
119	22.4 SW¼ sec 3	T. C. Murton	Slope	1952	398	220	Dr 4	4- ?-60	160+	Dm	L. Cased 6-inch also.
120	22.5 SW¼ sec 3	Sterling Whaley	Base of slope	1957		124	Dr 6	8-29-57	53.55	U	
121	22.6 SE¼ sec 3	Bellringer	Slope	1955	346	53	Dr 6	12- ?-55	41	Dm	L, 4 gpm.
122	22.6 SE¼ sec 2	I. Pellissier	Level	1957	346	25	Du 48			Dm	
123	22.6 SE¼ sec 3	Mackey	d0		354	29.5	Du 48	5- ?-55	29±		Well went dry winter 1954-55.
124	22.7 NE¼ sec 2	Allen's Grocery	Slope	1953	359	138	Dr 6	Summer-53	131	Dm	L.
125.	22.7 NE¼ sec 3	The Halfway House	Hill top	1955	365	145	Dr 6	?- ?-55	137	Dm	L.
126.	22.8 NE¼ sec 3	Kennicott	Slope	1956	351	147	Dr 6	5- ?-56	140	Dm	L, very little water.
127.	23.9 NW¼ sec 2	Boy Scouts of America (Camp Gorsuch)	Hill-slope				Spring			PS	Good quality.
		Township 16 North, Range 1 West									
128.	25.9 SW¼ sec 24	The Alaska Railroad (Eklutna Station)	Level		49	31	Dr 6	Fall-50	27	U	
129	25.9 SW¼ sec 24	d0	d0	1950	49	42	Dr 6	?-?-50	36	Dm	Coarse gravel.
130.	25.9 SW¼ sec 24	The Alaska Railroad (Eklutna School)	do		49	55	Dr 6		40	U	
		Township 16 North, Range 1 East									
131	26.1, NW¼ sec 19	The Alaska Railroad (Eklutna section house			36		Du 48	? 12-12-58 6-16-59	26 29.33	Dm PS	C, sandy gravel 0-36.
132	26.7, SE¼ sec 19	Old Eklutna Hydro-electric	do		43	20	Du 30		17		

Table 1

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (inches)		Water level		Use	Remarks
									Date	(feet) below land		
133	26.7, SE¼ sec 19	do	do	1958	43		Dr	6			Dm	
134	27.0, NE¼ sec 19	Federal Aviation Administration	Tidal flat		25	40	Du			12	Dm	Water sand at 5, gravel at bottom, water level and quality affected by tides.
135	32.7 sec 14	U. S. Bureau of Reclamation (Housing area)	Hill-slope	1951	230	103	Dr	8	5-17-51	23.5	PS	L, 30 gpm.
136	33.3 sec 13	U. S. Bureau of Reclamation	do	1952		120	Dr	6		24	U	L.
137	33.3 sec 13	do	do	1952		67	Dr	6			U	L.
138	33.4, NW¼ sec 24	U. S. Bureau of Reclamation	Base of mountain	1956		62	Dr	6	10-22-56	20	Dm	L.
139	33.6, NW¼ sec 24	U. S. Bureau of Reclamation (laboratory)	do	1951	37	99	Dr	3	7-7-51	15		L, 25 gpm.
140	34.4 sec 17	Norman Pichler	Flood-plain	1949	35	13	DD	1½	7-17-58	6.73	Dm	Sand 0-11, gravel 11-13, struck water at 9 feet.
141	35.1, NW¼ sec 16	Pioneer Peek Inn	Slope	1953	89	78	Dr	6	7-16-58 12-12-58	45.98 51.11	Dm PS	L, C.
142	35.2, NW¼ sec 16	F. L. Thompson	do	1955	92	81.3	Dr		9- 6-55	51.4	Dm	Sand and gravel 0-69, clay and gravel 69-81, gravel(water-bearing)81-84.
143	35.3, NW¼ sec 16	Goat Creek Garage	do	1956	92	84	Dr	6	5-12-56	68	Dm	Sand and gravel 0-74, clay and gravel (hard) 74-81, gravel (water bearing) 81-84, 10 gpm.
144	35.6, SE¼ sec 9	R. T. Freeman	Flood-plain	1955	50	30	DD	36	?- ?-55	27	Dm	Dug first 10 feet - all gravel.
145	35.6, SE¼ sec 9	do	do	1957	50	28	DL		?- ?-55	27	Dm	Dug first 10 feet - all gravel.

USGS well number	Milepost and section location	Owner or user	Topography	Year drilled	Altitude (feet)	Depth (feet)	Type well and diameter (inches)	Water level Date	Water level (feet) below land surface	Use	Remarks
146	35.6, NE¼ sec 16	Vukonich	Valley floor	1951	48	8	Du 48	?- ?-51	2	Dm	Gravel 0-8, occasionally goes dry.
147	35.8, SE¼ sec 9	Freeman	River-bank	1950	50	32			7	DD	Large gravel 0-18, sand, some hardpan at 19, (water below it).
148	36.0, NE¼ sec 9	A. H. Coffee	Hill-side	1957	82	70	Dr			Dm	
149	36.7, SE¼ sec 10	W. J. Champine	Terrace	1952	52	35	Dr 4	7-16-58 7-18-58 9-12-58	16.75 8.30 22.34	Dm	"Sliderock" 0-5, muck and sand 5-25, rock 25-35, hit water at 25 feet
150	37.1, NW¼ sec 11	Brown	do		48	9.5	Dr 6	2-25-58	5.38	U	Flooded annually
151	38.1, SW¼ sec 1	Knik Drive-Inn	River-bank	1955	61	41	DD			PS	Dug (some water) 0-20, driven 20-41.

Table 2. Chemical analyses of waters in the Chugiak area, Alaska.

Chemical Analyses in parts per million

Number		22	67	73	
Source of sample	Eagle River	Spring	Well	Well	Parks Creek
Date of Collection	5-3-56	7-9-59	9-22-55	2-16-58	8-1-59
Silica (SiO_2)	5.0	16	6.7	12	11
Aluminum (Al)	--	.1	--	--	.1
Iron (Fe), in solution when analysed	--	--	.21	--	--
Iron (Fe), Total	.00	.09	1.5	.07	.02
Manganese (Mn), in solution when analysed	--	.00	.00	.02	.00
Copper (Cu)	--	.01	--	--	.00
Zinc (Zn)	--	.00	--	--	.00
Calcium (Ca)	28	40	3.6	27	23
Magnesium (Mg)	5.1	7.8	.9	15	3.8
Strontium (Sr)	--	.4	--	--	.0
Sodium (Na)	3.0	3.6	500	7.0	1.8
Potassium (k)	1.0	.6	4.4	1.2	.5
Litium (Li)	--	.0	--	--	.0
Bicarbonate (HCO_3)	86	132	1070	162	75
Carbonate (CO_3)	0	2	0	0	0
Sulfate (SO_4)	22	19	.2	8.0	8.0
Chloride (Cl)	1.8	5.0	154	2.5	.5
Fluoride (F)	.0	.1	1.2	.1	.0
Nitrate (NO_3)	1.3	2.5	.2	.4	6.5
Phosphate (PO_4)	--	.06	--	--	.03
Dissolved solids					
Calculated	--	162	1200	153	92
Residue on evaporation at 180°C	190	--	--	--	--
Hardness as $CaCO_3$	91	132	12	129	73
Noncarbonate hardness as $CaCO_3$	20	24	0	0	12
Alkalinity as $CaCO_3$	--	108	--	--	62
Carbon dioxide (CO_2)	--	1	--	--	6
Specific conductance (micromhos at 25°C)	190	266	1960	255	152
pH	7.5	8.3	8.0	8.0	7.3
Color	8	5	--	0	5
Temperature (°F)	--	--	--	--	44
Depth, in feet	--	--	550	218	--
Laboratory number	1/	5479	3095	4576	5480

1/ U. S. Geological Survey, Water Supply Paper - 1486

Chemical Analyses in parts per million

Number	99	101			131
Source of Sample	Well	Spring	Peters Creek	Eklutna Creek	Well
Date of Collection	7-9-59	3-10-59	5-3-56	6-24-49	
Silica (SiO_2)	13	15	8.8	4.9	8.6
Aluminum (Al)	.1	--	--	--	--
Iron (Fe) in solution when analysed	--	--	--	--	.02
Iron (Fe) Total	.30	.05	.00	--	--
Manganese (Mn) in solution when analysed	.00	.01	--	--	--
Copper (Cu)	.05	--	--	--	--
Zinc (Zn)	1.9	--	--	--	--
Calcium (Ca)	19	13.	25	23	54
Magnesium (Mg)	9.8	6.7	5.5	5.2	14
Strontium (Sr)	.0	--	--	--	--
Sodium (Na)	2.6	1.7	3.2	2.5	4.1
Potassium (K)	.5	.5	.7		.7
Lithium (Li)	.0	--	--	--	--
Bicarbonate (HCO_3)	102	70	82	77	210
Carbonate (CO_3)	0	0	0	0	0
Sulfate (SO_4)	4.5	6.0	22	18	18
Chloride (Cl)	2.0	.0	.8	1.4	4.0
Fluoride (F)	.0	.0	.0	--	.1
Nitrate (NO_3)	3.0	1.9	2.0	1.2	5.3
Phosphate (PO_4)	.02	--	--	--	.01
Dissolved solids					
Calculated	109	79	--	--	212
Residue on evaporation at 180°C	--	--	108	94	--
Hardness as $CaCO_3$	88	60	85	79	192
Noncarbonate hardness as $CaCO_3$	4	2	18	16	20
Alkalinity as $CaCO_3$	84	58	67	63	172
Carbon dioxide (CO_2)	10	--	--	--	--
Specific conductance (micromhos at 25°C)	179	135	184	161	365
pH	7.2	6.8	7.8	6.8	8.0
Color	5	5	15	--	0
Temperature	--	--	--	--	--
Depth in feet	--	--	--	--	36
Laboratory number	5477	5213	1/	3/	5689

1/ U.S. Geological Survey, Water Supply Paper-1486
2/ At gaging station below Eklutna Lake
3/ U.S. Geological Survey, Water Supply Paper-1372

Chemical Analyses in parts per million

Number		141	
Source of sample	Eklutna Tunnell	Well	Goat Creek
Date of Collection	9-22-53	7-9-59	6-24-49
Silica (SiO_2)	13	10	5.2
Aluminum (Al)	--	.1	--
Iron (Fe) in solution when analysed	--	--	--
Iron (Fe) Total	.15	.07	--
Manganese (Mn) in solution when analysed	--	.01	--
Copper (Cu)	--	.8	--
Zinc (Zn)	--	.8	--
Calcium (Ca)	23	50	29
Magnesium (Mg)	13	6.0	5.9
Strontium (Sr)	--	.0	--
Sodium (Na)		4.7	
Potassium (k)	37	.9	2.3
Lithium (Li)	--	.0	--
Bicarbonate (HCO_3)	169	126	77
Carbonate (CO_3)	0	0	0
Sulfate (SO_4)	49	50	36
Chloride (Cl)	.7	1.5	.1
Fluoride (F)	.3	.0	--
Nitrate (NO_3)	.4	1.3	2.0
Phosphate (PO_4)	--	.06	--
Dissolved solids			
Calculated	220	187	--
Residue on evaporation at 180°C	--	--	118
Hardness as $CaCO_3$	111	150	97
Noncarbonate hardness as $CaCO_3$	0	46	34
Alkalinity as $CaCO_3$8	--	103	63
Carbon dioxide (CO_2)	--	2	--
Specific conductance (micromhos at 25°C)	350	304	205
pH	7.7	8.1	6.9
Color	8	0	--
Temperature (°F)	--	--	--
Depth, in feet	--	--	--
Laboratory number	2096	5478	2/

1/ From a fault zone

2/ U. S. Geological Survey, Water Supply Paper-1372

Table 3. Drillers' logs of water wells in the Chugiak area, Alaska.

Chu 12. Dale Pearson. Drilled by Swafford Drilling Co. 6-inch casing.

Material	Thickness (feet)	Depth (feet)
"Hardpan"	54	54
Sand and clay	20	74
"Hardpan".	15	89
Sand, tan.	21	110
"Hardpan".		

Chu 18. Balzwin. Drilled by Swafford Drilling Co. 6-inch casing.

No record	67	67
Gravel	3	70
"Hardpan.	16	86
"Hardpan" and clay streaks.	7	93
Gravel, coarse and fine (weak water	1	94
"Hardpan"	5	99
Sand, clayey, (water).	16	115
"Hardpan", hard and dry	11	126
No record (water)		

Chu 29. Theodore Ball. Drilled by Swafford Drilling Co. 6-inch casing. Altitude about 371 feet. Reported yield: 5 gpm; drawdown 2 feet.

Fill	6	6
Clay, "hardpan", and gravel.	53	59
Sand, dirty, and light tan gravel.	7	66
Sand, dirty, and dark maroon gravel.	25	91
No record (water).	3	94
Sand (water)	1	95

Chu 34. M. L. Folden. Drilled by Penn-Jersey Drilling Co. 6-inch casing. Reported yield: 10 gpm; drawdown 15 feet.

Gravel	25	25
Rocks, small	10	35
No record.	20	55
Gravel	5	60
Sand, hard	25	85
Gravel	25	110
Rock, soft	5	115
Gravel	10	125
Sand (water)	9	134

Chu 47. Jim Stegner. Dug by owner. Altitude about 298 feet.

Material	Thickness (feet)	Depth (feet)
Sand	18	18
Pea gravel, some boulders	6	24
Clay (shale?)	1	25
Sand (water)		

Chu 48. Chester Dee. Drilled by Swafford Drilling Co. 6-inch casing. Altitude about 297 feet. Hole abandoned?

"Hardpan"	40	40
Sand	19	59
Sand, heaving (some water)	3	62
Sand, fine and laminated coarser sand some gravel, (Heaved when driving)	11	73
Clay, gray, gravelly	37	110
Clay, sandy, tan	22	132
Clay, sandy, brown	18	150
Clay, gray	25	175

Chu 52. E. O. Whitt. Drilled by Penn-Jersey Drilling Co. 4-inch casing to 65 feet. Filled to 90 feet. Perforated: 30-36 feet. Altitude about 280 feet.

Rocks and boulders	20	20
"Clay"	15	35
Hardpan	75	110

Chu 56. O. J. Ivie. Drilled by Penn-Jersey Drilling Co. Reported yield: 3 gpm.

No record	38	38
Clay, red	48	86
Clay, blue, some coal, and decayed vegetation (oily)	31	117
Rock, gray, very hard (hard drilling, cuttings extremely fine, "possibly bedrock")	26	143
Clay, blue (oily, very difficult to mud)	18	161
Clay, reddish brown, some coal	17	178
Clay, blue, coal, and decayed vegetation	5	183
Clay, red, brown	5	188
Sandstone, gray	3	191
Clay, reddish brown	8	199

Chu 67. Robert Schroeder. Drilled by J. Merrington. 8 to 6-inch casing. Altitude about 289 feet.

Material	Thickness (feet)	Depth (feet)
Gravel and boulders	130	130
Sandstone	49	179
Shale	91	270
Coal (water)	6	276
Shale, occasional 6 to 8-foot sandstone layers and coal streaks near bottom (gas seepage below 500 feet)	274	550

Chu 72. Ed Ryan. Drilled by Robert Cross. 6-inch casing. Altitude about 529 feet. Hole abandoned?

Top soil	2	2
Clay, brown, and coarse gravel	10	12
Clay, gray, and fine gravel.	15	27
Clay and fine gravel	1	28
Clay, gray	13	41
Gravel and rock	1	42
Bedrock	8	50

Chu 73. Fire Lake Lodge. Drilled by S. L. Cotten. 6-inch casing. Altitude about 510 feet. Reported yield: less than 1 gpm.

Clay and medium gravel	21	21
Greenstone, medium hard.	12	33
Greenstone, extra hard	19	52
Greenstone, hard	12	64
Greenstone, medium hard with quartz bands, thin cracks filled with clay.	33	97
Shale, black with bands of greenstone - black sludge.	7	104
Greenstone, very hard.	8	112
Shale, black, and sludge, black, few bands of greenstone.	9	121
Greenstone, very hard	23	144
Sludge, black, slates, and shale, small amounts of greenstone.	20	164
Greenstone, hard, usual green sludge. . . .	6	170
Greenstone, extremely hard, greenish-white to white sludge, cracks filled with clay (white).	36	206
Clay, soft, white (water-bearing)	.5	206.5
Greenstone, hard, white sludge	3.5	210
Clay, soft, white (water-bearing).	1	211

Chu 95. Quiller Burns. Drilled by Penn-Jersey Drilling Co. Altitude about 550 feet. Reported yield: 20 gpm; drawdown 2 feet.

Material	Thickness (feet)	Depth (feet)
Gravel	10	10
Sand	15	25
Clay	5	30
Gravel	18	48
Quicksand	7	55
Sand	5	60
Sand (water)	4	64

Chu 100. Paul Wesolik. Drilled by G and G Drilling Co. 6-inch casing. Reported yield: 10 gpm; drawdown 5 feet.

Top soil	1	1
Hardpan	133	134
Sand and gravel (water-bearing)	9	143

Chu 105. Russell Oberg. Drilled by S. L. Cotten. 6-inch casing. Altitude about 367 feet. Reported yield: 11 gpm.

Hardpan, few large rocks near surface	26	26
Clay, gray	26	52
Hardpan, with boulders	28	80
Muck, brown, and rocks	11	91
Muck, brown, and medium gravel	24	115
Clay, brownish to yellow, gravel and rocks	7	112
No record	30	152
Clay and gravel, brownish to yellow	6	158
Gravel, small, and clay	7	165
Gravel, medium, and clay	15	180
Sand and clay	4	184
Sand, little clay	3	187
Sand and gravel (a little water)	2	189
Sand and mixed gravel	3	192

Chu 106. Earl Ray. Drilled by S. L. Cotten. Altitude about 454 feet. Reported yield: 13 gpm; drawdown 5 feet.

No record	86	86
Boulders, heavy	22	108
Clay, brownish	18	126
Clay, gravel, and boulders (some water at 129 feet)	8	134
Gravel and rocks	6	140
Clay, soft, brown, and rocks	16	156
Sand, gravel, rocks, and clay	9	175

Chu 108. Bud Whaley. Drilled by G and G Drilling Co. 6-inch casing. Reported yield: 30 gpm; drawdown 10 feet.

Material	Thickness (feet)	Depth (feet)
Top soil	2	2
Hardpan	98	100
Boulders, large	30	130
Clay	50	180
Sand and pea gravel	8	188

Chu 109. John Schneider. Drilled by C and G Drilling Co. Altitude about 528 feet.

Top soil	2	2
Boulders	10	12
Clay and gravel	31	43
Gravel (water)	3	46

Chu 114. Ray Michlig. Drilled by Hyland Drilling Co. 6-inch casing. Reported yield: 4½ gpm; drawdown 3 feet.

"Hard clay", yellow	7	7
"Hard clay", gray	3	10
"Hard clay", yellow	4	14
"Hard clay", gray	19	33
Soup, gravel, clay, and stone (water)	.5	33.5
Sand, fine	15.5	49
"Hard clay", dirty gray, and stone (water)	10	59
Table, gray, medium	9.5	68.5
Table, gray, hard	11.5	80
Sand, and gravel, clean		

Chu 116. Stockhausen. Drilled by J. D. Conboy. 6-inch casing. Altitude about 368 feet. Reported yield: 20 gpm; drawdown 5 feet

Gravel and boulders	20	20
Sand and gravel, some clay	63	83
Hardpan	2	85
Gravel	2	87

Chu 118. L. V. Jahr. Drilled by Penn-Jersey Drilling Co. 6-inch casing. Reported yield: 5 gpm; drawdown 2½ feet.

Rocks and gravel	60	60
Hardpan	30	90
Hardpan (gravel and rock)	19	109
Sand and gravel (water)	4	113
Hardpan and rock	2	115

Chu 119. T. D. Murton. Drilled by L. Nigle. 6-inch casing relined with 4-inch. Altitude about 398 feet.

Material	Thickness (feet)	Depth (feet)
"Hardpan"	65	65
Clay, sandy	4	69
Clay and gravel, reddish	61	130
Clay, blue, stick	40	170
"Hardpan", little water in sandy or gravelly matter at base of clay	5	175
Clay, blue, stick	45	220

Chu 121. Bellringer. Drilled by Hyland Drilling Co. 6-inch casing. Altitude about 346 feet. Reported yield: 4 gpm; drawdown 10 feet.

"Hard clay", yellow	20	20
Rock and gray "hard clay"	31	51
Gravel, loose, yellow	.5	51.5
Sand and gravel, yellow (water)	1.5	53

Chu 124. Allen's Grocery. Drilled by Hamilton and Cotten. 6-inch casing. Altitude about 359 feet.

No record	94	94
Clay, gray, gravel, and some sand (small water trickle at 105 feet)	21	115
Clay, gray and fine gravel, few rocks	19	134
Sand, fine gravel, and some clay (water from gravel at bottom)	5	139

Chu 125. The Halfway House. Drilled by Sunset Drilling Co. 6-inch casing. Altitude about 350 feet.

Dug well		
Hardpan	40	40
Gravel	20	60
Hardpan (water)	33	93
Drilled well		
Hardpan	52	145

Chu 126. Kennicott. Drilled by Philip Brandl. 6-inch casing. Altitude about 351 feet.

No record	18	18
Clay, bouldery, hard	22	40
Boulders	5?	45?
Clay, bouldery, hard	95?	139
No record (very little water)	8	147

Chu 135. U. S. Bureau of Reclamation. Drilled by USBR. 8-inch casing. Altitude 230 feet. Reported yield: 30 gpm; drawdown 2.7 feet.

Material	Thickness (feet)	Depth (feet)
Top soil, moss, and humus	2.5	2.5
Clay, sandy, silty, with angular pebbles. . . cobbles, and boulders of graywacke. Some scattered fragments of Dunite	39.5	42
Clay, sandy silty, with angular cobbles and boulders of graywacke. Very few rounded rocks	28	70
Clay, plastic, sandy, with some glacial flour, with scattered angular to subrounded pebbles, cobbles, and boulders. . .	33	103

Chu 136. U. S. Bureau of Reclamation. Drilled by Philip Brandl. 6-inch casing.

Boulders	15	15
Silt.	31	46
Pea gravel (water)	7	53
Silt (pieces of Cottonwood at 115-120 feet)	67	120

Chu 137. U. S. Bureau of Reclamation. Drilled by Philip Brandl. 6-inch casing.

Boulders	15	15
Silt.	38	53
Gravel.	14	67

Chu 138. U. S. Bureau of Reclamation. Drilled by S. L. Cotten. 6-inch casing.

Gravel, hard.	16	16
Sliderock, intermittent layers of blue clay, silt, and gravel.	11	27
Clay, brown, layers of stream gravel.	31	58
Gravel.	4	62
Bedrock		

Chu 139. U. S. Bureau of Reclamation. Drilled by USBR. 8-inch casing. Altitude 37 feet.

Compacted fill	8	8
Sand, gray, silty, and gravel to 2½-inch maximum size	19	27
Clay, dark gray, sandy, and some gravel. . .	9	36
Clay, dark gray, silty, with little sand . .	14	50
Clay, dark gray, silty with some gravel to 2½-inch maximum size	10	60
Sand, gray, medium-to coarse-grained, with some gravel and a little clay from 70 to 74 feet	14	74
Clay, dark gray, sandy (about 50-50%). . . .	18	92
Sand, fine, clean, (water-bearing)	7	99

Chu 141. Pioneer Peek Inn. Drilled by Hamilton and Cotten. 6-inch casing. Altitude about 89 feet.

Material	Thickness (feet)	Depth (feet)
No record (old dug well)	12	12
Slide rock, loose, and silt.	38	50
No record (water)	1	51
Hardpan	27	78
(water)		

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